Chapter 2: Physics in Action (p. 128)

Chapter Challenge

Criteria

Written script

- Choose a sport – laws of physics that apply
- Video: 2-3 min
- in the narration – physics of the sport
  - ↳ record a video, Live, record soundtrack to an existing video

Entertaining

Scoring

written script 5 pts.
entertaining 5 pts.
Video: 2-3 min (10 pts, -5p < 2min, -1pt/min > 4min)
physics of sport: +2pts/physics law applied
minimum 5 law applications

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30 pts

Physics Corner (p. 131)

Section 1 Newton's First Law: A Running Start (p. 132) 2/10/14

WDYS kids playing soccer, #3 kicked the ball to high/ over the net / w/ too much force, the boy towards the bottom looks bored + kicks the ball limply, dung beetle rolling ball, mouse kicks ball w/ effort but the ball is too big, puppy bored by lack of effort of boy towards bottom

WDYT

ice is slick, blades are thin + help them glide
blades are sharp, blades help them accelerate
because of force, maybe traveling down hill

Section 1 Newton's First Law: A Running Start (p. 132) 2/10/14

IWBAT describe Galileo's law of motion, apply Newton's first law of motion, recognize inertial mass as a property of matter, and explain that speed depends on frame of reference. I will do this through team experiments and discussions with my team and the whole class. I will demonstrate my understanding through answering questions in the Physics Talk, Checking Up, and/or Physics to Go.

Section 1 Newton's First Law: A Running Start (p. 132) 2/10/14

Investigate

Hold the ramp by placing no more than two fingers at each end and pressing the ends gently toward the center to cause a gentle bend.

Section 1 Newton's First Law: A Running Start 2/11/14

Physics Talk (p. 134)

Galileo's Law of Inertia - an object at rest will stay at rest and an object in motion will continue moving straight unless a force acts on it

Newton's First Law of motion

2/12/14

in the absence of an unbalanced force, an object at rest remains at rest, and an object already in motion will remain in motion with a constant speed in a straight line

Section 1 Newton's First Law: A Running Start 2/12/14

Physics Talk (p. 134)

inertia - the natural tendency of an object at rest to remain at rest or an object in motion to keep moving; more mass = more inertia

Mass (kg) 1 kg ~ 2.2 lbs

1 tonne = 1,000 kg (metric ton)

1 ton = 2,000 lbs

Section 1 Newton's First Law: A Running Start 2/12/14

Physics Talk (p. 134)

running start:

$v_{javelin} = v_{body} + v_{shoulder} + v_{elbow} + v_{hand}$

frames of reference

68,800 mph

It depends on the position of the observer relative to the object being observed

Section 1 Newton's First Law: A Running Start

2/12/14

Complete:
Checking Up (p. 138) #1, 2, 5, & 6
Physics to Go (pp. 143-144) #1-4, & 10

Section 2 Constant Speed and Acceleration: Measuring Motion   p. 145   2/12/14

WDYS a dog walking slow, the boy looks like he's sleep walking, there's a snail walking faster than the boy. Papers are falling out of his backpack. The bottom picture the boy is running and looks in love and has some flowers and the dog is running with him. Foot prints were farther apart when he was running. 2nd pic he has more motivation to move faster.

WDYT really fast, speed of an object, distance (large amt.)

Section 2 Constant Speed and Acceleration: Measuring Motion

2/13/14

IWBAT give examples of distance, time, speed, and acceleration, differentiate between instantaneous and average speed, recognize when motion is accelerated, and calculate average speed and acceleration. I will do this through team experiments and discussions with my team and the whole class. I will demonstrate my understanding through answering questions in the Physics Talk, Checking Up, and/or Physics to Go.

Section 2 Constant Speed and Acceleration: Measuring Motion   p. 145   2/13/14

Investigate:

- One set of tapes and graphs per team
- Please use graph paper to set up your graphs
- Each dot is placed every 1/60th of a second ... 60 dots are drawn each second

2/14/14

Complete Investigate steps 7-11.

Section 2 Constant Speed and Acceleration: Measuring Motion

2/14/14

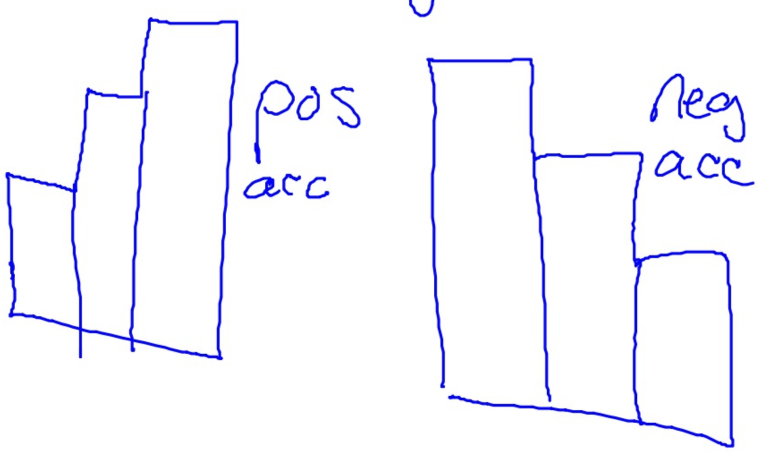
Physics Talk (p. 148)

acceleration - Change in speed/Velocity over time

positive acc. - gain in speed/increase in velocity

Negative acc. — Loss of speed/decrease in velocity

Constant Velocity - no acceleration



$a = \frac{\Delta v}{\Delta t}$

6 dots $= \frac{1}{10}$ sec

$v_{av} = \frac{v_2 + v_1}{2}$

Section 2 Constant Speed and Acceleration: Measuring Motion — 2/14/14

Complete:
Checking Up (p. 151) #1-4
Physics to Go (pp. 154-156) #2, 3, 7, & 14

Homework:
Find 3 examples of Newton's First Law of Motion (or Galileo's Law of Inertia) in sports (Olympic or otherwise) this weekend. Be prepared to share out on Wednesday.

Homework: 2/19/14

Find 3 examples of Newton's First Law of Motion (or Galileo's Law of Inertia) in sports (Olympic or otherwise) this weekend. Be prepared to share out on Wednesday.

Section 3 Newton's Second Law: Push or Pull — p. 157 — 2/19/14

WDYS
- Some kid pushing a ball w/ stick.
- Dog running eventually ends up in car.
- Kid walking, Jogging, then running
- Mountines in the background.
- Boy in a plain field
- Symbols: music, question, !
- Looks like boy trips

WDYT

Force: a push or a pull

TB: goes farther & faster

BB: Not far & slower

Tennis

Bowling

Section 3 Newton's Second Law: p. 157 2/19/14

Push or Pull

Investigate:

Your items to push include:

- cart
- plastic bottle
- slotted weights

There are four pennies per group for steps 8 & 9.

2/20/14

You have until 8:25 to complete the Investigate.

Quantitative – quantities – stuff you can measure

Qualitative – using your senses

Section 3 Newton's Second Law: Push or Pull p. 157 2/20/14

Physics Talk (p. 160)

Jigsaw

Team 1 (Dalia, Cyrus, Valeria M., Ariana)

Team 2 (Yesenia, Amy, Jasmine, Julissa)

Team 3 (Valeria S., Yudith, Jacky, Samantha)

Evidence for Newton's Second Law of Motion (p. 160)
Team 1

- **An object with more mass and same force it does not accelrate** As much
- Acceleration decreases with an increase in mass the direction of the mass is the same as the unballanced force
- The acceleration of an object is directly porortional to the unballanced force used on it
- As the force gets larger the accelration gets larger.
- The larger the mass the smaller the acc. inverse proportions
- The change in motion is proportional to the motive force impressed and is made in direction of the right line in witch the force is impressed

Section 3 Newton's Second Law: Push or Pull p. 157 2/21/14

An Equation for Newton's Second law of Motion (p. 161)

Team 2

Second law of motion equation:

$$\text{acceleration } (m/s^2) = \frac{\text{force}}{\text{mass}}$$

Section 3 Newton's Second Law: Push or Pull p. 157 2/21/14

Newton: A Derived SI Unit with a Special Name (pp. 161-162)
Team 3

Speed-meters per second(m/s)

- Acceleration-meters per second per second ([m/s]/s or m/s^2)

- Newton - Force required to make 1 kilogram of mass accelerate at 1 meter per second squared(N) 1N

$1N = 1kg\ m/s^2$

1kg + or $\frac{m}{s^2}$ or 1kg x $\frac{m}{s \times s}$

Section 3 Newton's Second Law: p. 157 2/21/14
Push or Pull

Where There's Acceleration, There Must be an Unbalanced Force (p. 162) Team 2

- With acceleration there is always an unbalanced force.
- Sometimes an object is too large and the force is too small to measure.
- Just because the force is too small does not mean it is not there. Newton's second law is ALWAYS valid.

Section 3 Newton's Second Law: Push or Pull p. 157 2/21/14

Calculations and Units (p. 163) & Using Measurements in Calculations (p. 164) Team 3

You can write the unit N as $kg \cdot m/s^2$
kg in the top and bottom of equation
cancel out, leave m/s, the unit for
acceleration that you need for you answer.

Expressing the result of your calculation in a way that makes
scense of the precision of measurements you used. Look at
the number of significant figuers or digits in the number.
The number of significant figuers how carefully & with
what level of accuracy the measurement was taken.

Section 3 Newton's Second Law: Push or Pull p. 157 2/24/14

Determining the Number of Significant Figures in a Measurement (p. 165) Team 1

- All non-zero digits are significant
- If a zero is by itself in front of or behind the decimal point, it is NOT significant 0.1 1.0
- If a zero is between non-zero digits, it IS significant 102
- The zeros following a non-zero digit or preceeding a non-zero digit are not significant 200 0.002
- The number of decimal places does not change when adding or subtracting 342 + 28.5 = 370.5
- Multiplying or dividing: the number with the fewest significant digits determines the number of sig Figs in your answ.

Section 3 Newton's Second Law: Push or Pull   p. 157   2/24/14

Gravity, Mass, Weight, and Newton's Second Law (p. 166)

gravity - is <u>not</u> a force, it is an acceleration

$F_{gravity} = m \cdot a_{gravity}$ m (kg)

a (m/s^2)

$F_{gravity} = Weight$ (N) F ($kg \cdot m/s^2$ or N)

$a_{gravity} = g$ $g_{earth} = 9.8\ (m/s^2)$

$W = m \cdot g$

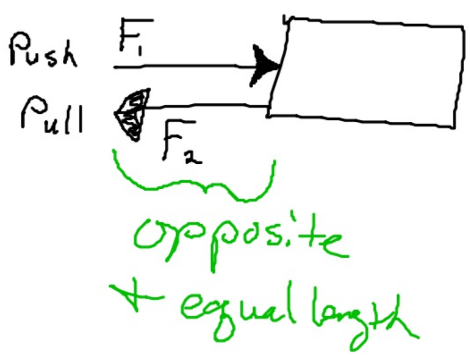
Section 3 Newton's Second Law: Push or Pull   p. 157   2/24/14

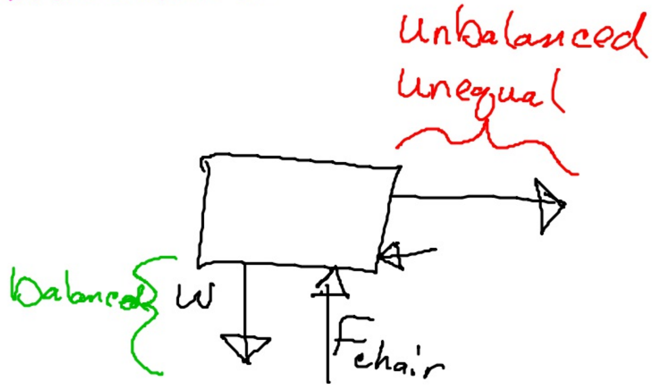
Balanced and Unbalanced Forces (p. 167)

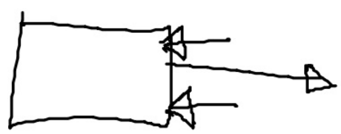
Balanced - no change in movement

Unbalanced - change in movement

Force diagrams

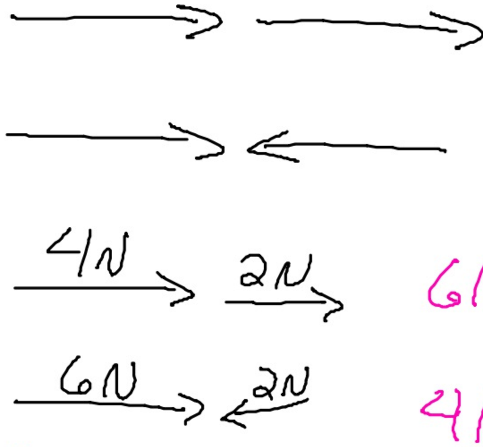






Section 3 Newton's Second Law: Push or Pull   p. 157   2/24/14

Adding vectors (p . 168)



Same direction: add

opposite direction: subtract

6N to the right

4N to the right

direction determined by larger force

Section 3 Newton's Second Law: Push or Pull   p. 157   2/24/14

Complete:
Checking Up (p. 167) #1-4
Physics to Go (pp. 171-173) #3, 4, 10, 12, 15, & 18

Section 4 Projectile Motion: p. 174 2/25/14
Launching Things into the Air

WDYS The girl throwing an apple and dropping an apple from the top of a ladder. The guy at the bottom is timing them. He is moving his head so he appears to be a Siamese twin. The cat sits bravely while the dog runs for his life. The apples gain speed while falling.

WDYT More force – farther travel

the weather

distance from ground

Section 4 Projectile Motion: Launching Things into the Air   p. 174   2/25/14

IWBAT apply the terms free fall, projectile, trajectory, and range; provide evidence concerning projectiles launched horizontally at different speeds; explain the relationship between the vertical and horizontal components of a projectile's motion; recognize the factors that affect the range of a projectile; and infer the shape of a projectile's trajectory. I will do this through team experiments and discussions with my team and the whole class. I will demonstrate my understanding through answering questions in the Physics Talk, Checking Up, and/or Physics to Go.

Section 4 Projectile Motion: p. 174 2/25/14
Launching Things into the Air

Investigate

Part A
#2: You will olny use your fingers to move the coin.
#4: Use algebra text books to change the height
of the launch

IWBAT apply the terms free fall, projectile, trajectory, and range; provide evidence concerning projectiles launched horizontally at different speeds; explain the relationship between the vertical and horizontal components of a projectile's motion; recognize the factors that affect the range of a projectile; and infer the shape of a projectile's trajectory.

Section 4 Projectile Motion: p. 174 2/26/14

Launching Things into the Air

Physics Talk (p. 177)

projectile – an object traveling through the air or other medium

Vertical motion is not affected by the horizontal motion; they are independent from each other

You will see what you have preconceived about a situation

$v \uparrow +,\ v \downarrow -$

$g = -9.8\ m/s^2$ or $-10\ m/s^2$

at the top of the arc the velocity $= 0\ m/s$

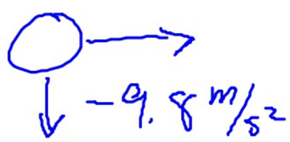
$a = -9.8\ m/s^2$

IWBAT apply the terms free fall, projectile, trajectory, and range; provide evidence concerning projectiles launched horizontally at different speeds; explain the relationship between the vertical and horizontal components of a projectile's motion; recognize the factors that affect the range of a projectile; and infer the shape of a projectile's trajectory.

Section 4 Projectile Motion: p. 174 2/26/14

Launching Things into the Air

trajectory – the path taken by a projectile; curved path (parabola)



IWBAT apply the terms free fall, projectile, trajectory, and range; provide evidence concerning projectiles launched horizontally at different speeds; explain the relationship between the vertical and horizontal components of a projectile's motion; recognize the factors that affect the range of a projectile; and infer the shape of a projectile's trajectory.

Section 4 Projectile Motion: p. 174 2/26/14
Launching Things into the Air

Complete:
Checking Up (p. 178) #1-3
Physics to Go (pp. 182-183) #4, 5, 6, & 11

IWBAT apply the terms free fall, projectile, trajectory, and range; provide evidence concerning projectiles launched horizontally at different speeds; explain the relationship between the vertical and horizontal components of a projectile's motion; recognize the factors that affect the range of a projectile; and infer the shape of a projectile's trajectory.

Section 5 The Range of Projectiles: The Shot Put   p. 184   2/26/14

WDYS Kids playing soccer, ball bounces off boy's head and into goal, girl kicked ball w/a lot of force, dog chasing ball, math expressions on the scoreboard, expression is that for a parabola, goalie could not get to the ball in time

WDYT

Various angles - Steep ∡ : higher + not as far ∩

Lower ∡ : not as high but farther ⌒

Same ∡, different launch speeds' effect on range

higher: travel farther

lower: less far

Section 5 The Range of Projectiles: The Shot Put | p. 184 | 2/27/14

IWBAT measure the acceleration due to gravity, calculate the speed attained by an object that has fallen freely from rest, identify the relationship between the average speed of an object that has fallen freely from rest and the final speed attained by the object, calculate the distance traveled by an object that has fallen freely from rest, use the mathematical models of free fall and uniform speed to construct a physical model of the trajectory of a projectile, use the motion of a real projectile to test a physical model of projectile motion, and use a physical model of projectile motion to infer the effects of launch speed and launch angle on the range of a projectile. I will do this through team experiments and discussions with my team and the whole class. I will demonstrate my understanding through answering questions in the Physics Talk, Checking Up, and/or Physics to Go.

Section 5 The Range of Projectiles: The Shot Put | p. 184 | 2/27/14

Investigate

Step 1: We will use the second method: tickertape timer with a weight.

Steps 3 & 4: Mass w/ strings already assembled.

Steps 5-11: Class as one group

IWBAT measure the acceleration due to gravity, calculate the speed attained by an object that has fallen freely from rest, identify the relationship between the average speed of an object that has fallen freely from rest and the final speed attained by the object, calculate the distance traveled by an object that has fallen freely from rest, use the mathematical models of free fall and uniform speed to construct a physical model of the trajectory of a projectile, use the motion of a real projectile to test a physical model of projectile motion, and use a physical model of projectile motion to infer the effects of launch speed and launch angle on the range of a projectile.

Section 5 The Range of Projectiles: The Shot Put | p. 184 | 2/28/14

Physics Talk (p. 188)

Model

Section 5 The Range of Projectiles: The Shot Put p. 184 2/28/14

Complete:
Checking Up (p. 189) #1-3
Physics to Go (pp. 194-195) #1, 2 3, 4, 6, & 8

IWBAT measure the acceleration due to gravity, calculate the speed attained by an object that has fallen freely from rest, identify the relationship between the average speed of an object that has fallen freely from rest and the final speed attained by the object, calculate the distance traveled by an object that has fallen freely from rest, use the mathematical models of free fall and uniform speed to construct a physical model of the trajectory of a projectile, use the motion of a real projectile to test a physical model of projectile motion, and use a physical model of projectile motion to infer the effects of launch speed and launch angle on the range of a projectile.

Section 6 Newton's Third Law: Run and Jump p. 198 3/03/14

WDYS L: Guy in rolling chair w/ feet against the wall
Wall is curved inward
Guy skateboarding, dog w/ green ball cap,
girl in window
Skate boarder pushing w/ one foot

R: Guy in chair pushed off of the wall, dog's hat flew off of his head, guy on skate board has 2 feet on board and has moved further along, Wall is curved outwards, girl's hair being blown around, paper has moved off the ground, chair guy has speed lines

Section 6 Newton's Third Law: Run and Jump p. 198 3/03/14

WDYT Bend your knees to lower your body
Straighten your knees quickly
Push with your feet (heels lifted)
Push down with the toes against the floor

Section 6 Newton's Third Law: Run and Jump p. 198 3/03/14

IWBAT provide evidence that forces come in pairs with each force acting on a different object, use Newton's third law to analyze physical situations, and describe how Newton's third law explains much of the motion in your everyday life.I will do this through team experiments and discussions with my team and the whole class. I will demonstrate my understanding through answering questions in the Physics Talk, Checking Up, and/or Physics to Go.

Section 6 Newton's Third Law: Run and Jump   p. 198   3/03/14

Investigate
Part A
1 & 2: Class
3 & 4: Small group

Part B
1-4: Small group

IWBAT provide evidence that forces come in pairs with each force acting on a different object, use Newton's third law to analyze physical situations, and describe how Newton's third law explains much of the motion in your everyday life.I will do this through team experiments and discussions with my team and the whole class.

Section 6 Newton's Third Law: Run and Jump 3/03/14

Physics Talk (p. 201)

Team 1: Pushing & Pulling Back (p. 201)
Identifying the opposite and equal forces (p. 203)

Team 2: How to draw a free body diagram (p. 203)
& Drawing free body diagrams (p. 204)
Challenging Newton's third law (p. 205)

Team 3: Inanimate objects can push back (p. 202)
How Newton described the third law of motion (p. 204)

IWBAT provide evidence that forces come in pairs with each force acting on a different object, use Newton's third law to analyze physical situations, and describe how Newton's third law explains much of the motion in your everyday life.I will do this through team experiments and discussions with my team and the whole class.

Section 6 Newton's Third Law: Run and Jump		p. 198		3/03/14

Physics Talk (p. 201)

Team 1: Pushing & Pulling Back (p. 201)

AN ACCELERATION IS ALWAYS ACCOMPANIED BY AN UNBALANCED FORCE

NEWTON'S THIRD LAW STATE THAT FORCES ALWAYS COME IN EQUAL + OPPOSITE PAIRS

THE EQUAL + OPPOSITE PAIRS OF FORCES IN NEWTON'S THIRD LAW ALWAYS ACT ON DIFFERENT OBJECTS

IWBAT provide evidence that forces come in pairs with each force acting on a different object, use Newton's third law to analyze physical situations, and describe how Newton's third law explains much of the motion in your everyday life.I will do this through team experiments and discussions with my team and the whole class.

Section 6 Newton's Third Law: Run and Jump 3/03/14

Physics Talk (p. 201)

Team 2: How to draw a free body diagram (p. 203) & Drawing free body diagrams (p. 204)

- FBD shows how the forces acting on an object are related
- The arrow points in the direction of the force
- The arrow should be labeled w/ the type of force
- The weight arrow comes from the center of mass
- C.O.M. is where the object's mass appears to be concentrated

IWBAT provide evidence that forces come in pairs with each force acting on a different object, use Newton's third law to analyze physical situations, and describe how Newton's third law explains much of the motion in your everyday life.I will do this through team experiments and discussions with my team and the whole class.

Section 6 Newton's Third Law: Run and Jump 3/03/14

Physics Talk (p. 201)

Team 3: Inanimate objects can push back (p. 202)

- Something does not have to be alive to push
- Forces always come in pairs. These forces always act on different object - Newton's Third law
- An inanimate object can apply a force by Bending
- Gravity pulls Down on the mass.

IWBAT provide evidence that forces come in pairs with each force acting on a different object, use Newton's third law to analyze physical situations, and describe how Newton's third law explains much of the motion in your everyday life.I will do this through team experiments and discussions with my team and the whole class.

Section 6 Newton's Third Law: Run and Jump 3/03/14

Physics Talk (p. 201)

Team 1: Identifying the opposite and equal forces (p. 203)

Generally, if two objects are touching then they are applying equal and opposite forces on each other.

Gravity works at a distance and does not require the objects to touch, but the objects need to be relatively close to each other.

IWBAT provide evidence that forces come in pairs with each force acting on a different object, use Newton's third law to analyze physical situations, and describe how Newton's third law explains much of the motion in your everyday life.I will do this through team experiments and discussions with my team and the whole class.

Section 6 Newton's Third Law: Run and Jump 3/03/14

Physics Talk (p. 201)

Team 3: How Newton described the third law of motion (p. 204)

- Forces act opposite from each other
- Forces come in pairs
- Forces in pairs are of equal size (magnitude)
- This always happens.

IWBAT provide evidence that forces come in pairs with each force acting on a different object, use Newton's third law to analyze physical situations, and describe how Newton's third law explains much of the motion in your everyday life.I will do this through team experiments and discussions with my team and the whole class.

Section 6 Newton's Third Law: Run and Jump 3/03/14

Physics Talk (p. 201)

Team 2: Challenging Newton's third law (p. 205)

IWBAT provide evidence that forces come in pairs with each force acting on a different object, use Newton's third law to analyze physical situations, and describe how Newton's third law explains much of the motion in your everyday life.I will do this through team experiments and discussions with my team and the whole class.

Section 6 Newton's Third Law: Run and Jump

3/03/14

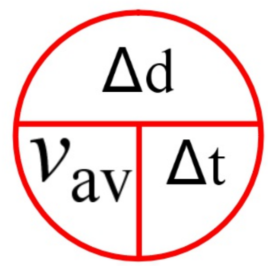
Complete:
Checking Up (p. 205) #1-3
Physics Plus (p. 206) #1
Physics to Go (pp. 208) #2 3, 4, & 8

IWBAT provide evidence that forces come in pairs with each force acting on a different object, use Newton's third law to analyze physical situations, and describe how Newton's third law explains much of the motion in your everyday life.I will do this through team experiments and discussions with my team and the whole class.

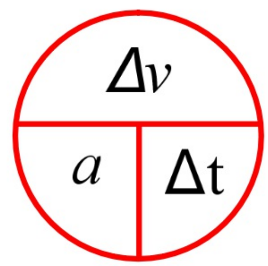
3/6/14

$$v_{av} = \frac{(v_1 + v_2)}{2}$$

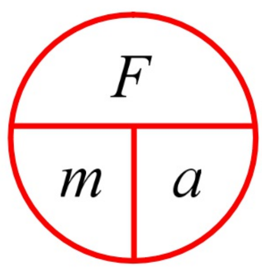
$$v_{av} = \frac{\Delta d}{\Delta t}$$



$$a = \frac{\Delta v}{\Delta t}$$



$$F = ma$$



$$d = \frac{v_i^2}{2a}$$